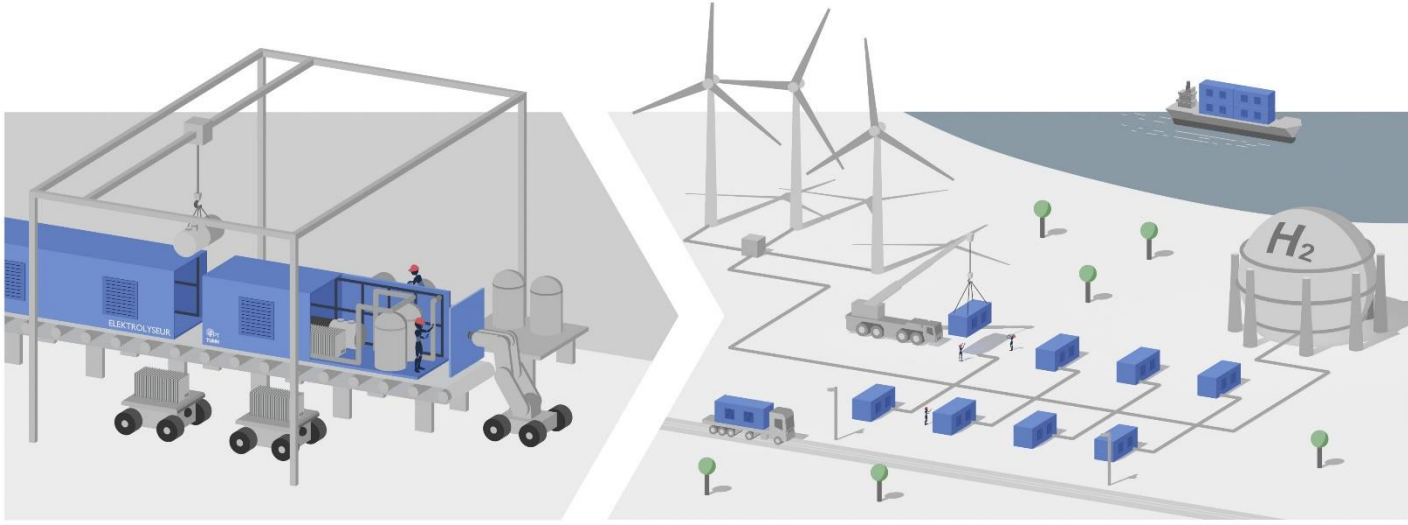


Write your **Thesis** at the Institute of  
Aircraft Production Technology

## **Design of an augmented reality process guidance for manual leakage inspection of hydrogen systems using tracking technologies**

In the course of the energy transition, there is a great demand for green hydrogen, which is produced from renewable energies by hydrogen electrolysis. For this reason, it is important to install large electrolysis systems as rapidly as possible and to enable an efficient operation of these systems. Such hydrogen-carrying systems must be checked for leaks both at commissioning and on a regular basis during operation. In this process, all sealing surfaces are checked manually using a measuring device. In addition to being highly flexible, the process is highly dependent on the skills of the operator or the availability of trained employees. In addition, corresponding documentation is necessary, which is time-consuming and error-prone, especially in the case of large and complex electrolyzer systems.

Digitally integrated inspection processes offer the possibility of automatic documentation of inspection processes relevant to approval by authorities. Suitable human-machine interfaces can be used to increase the efficiency of digitally integrated inspection processes and reduce the need for training. With augmented reality (AR) devices, digital process instructions can be displayed visually in an immersive manner directly in the real environment by providing direct user feedback.



The core problem of the work is to implement an exemplary process control for a measurement process using the Microsoft Holo Lens 2 in Unity. For this purpose, it is necessary to integrate a real-time tracking in order to generate live localization information of the user, his environment, and the manually guided measuring device. Suitable solutions are to be selected and implemented for the tracking. With the help of the tracking information a process control for a measuring process including interaction methods (e.g. for a user feedback) shall be designed and implemented. Finally, the AR scene is to be tested in real life on an application example and evaluated with regard to selected criteria (e.g. accuracy).

### Your subtasks

- State of the art & determination of requirements for an augmented leak detection system
- Analysis of the test process (optimal process control, data interfaces)
- Analysis, selection and implementation of tracking solution(user input, measurement equipment, H2 system components)
- Application development in Unity incl. modeling of interaction mechanisms for a user feedback based on an exemplary application
- Execution of tests on an application demonstrator & evaluation (advantages/disadvantages/accuracy/effort/benefit)
- Documentation of the work

### Your profile

- You study mechatronics, (media) computer science or a comparable subject
- You have good knowledge in programming with Unity (C#), Python
- Experience with measurement technology, data interfaces (e.g. OPC UA) and AR applications

If you are interested please contact :

Christian Masuhr, M.Sc. | [christian.masuhr@tuhh.de](mailto:christian.masuhr@tuhh.de)